CO-LABS ECONOMIC IMPACT STUDY

Prepared by: the Leeds School of Business

Business Research Division

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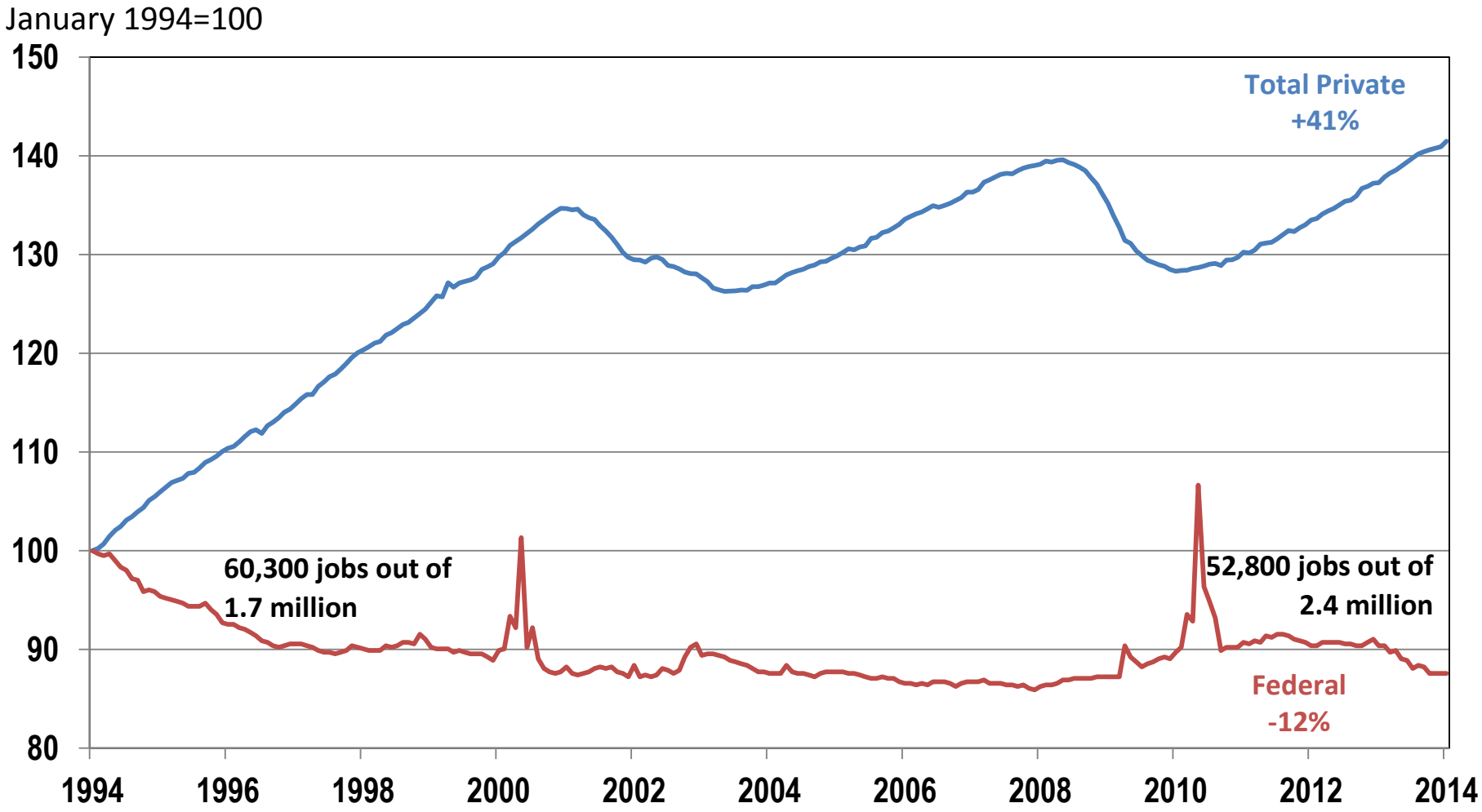
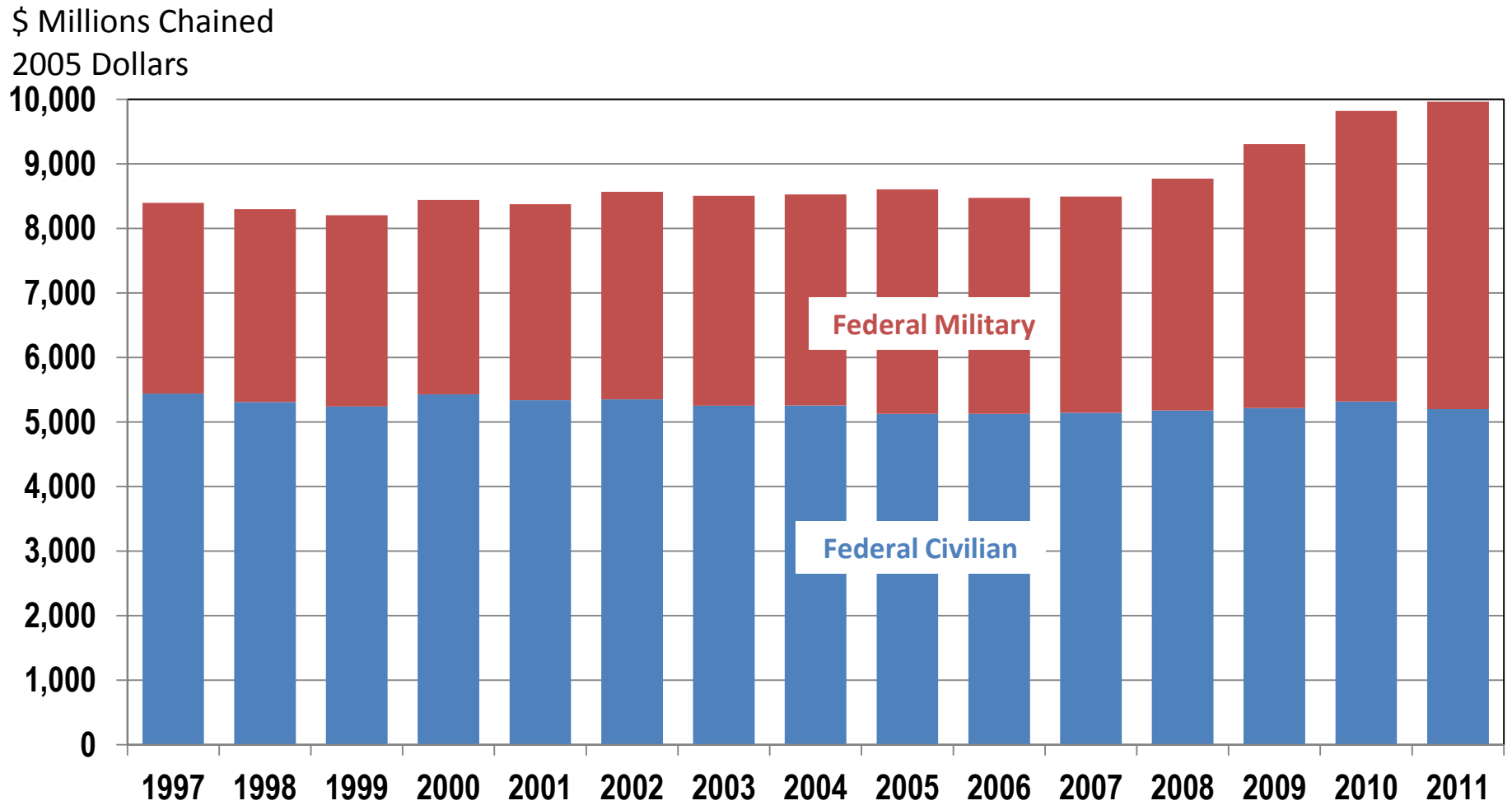
Indexed Colorado Employment
1994-2014



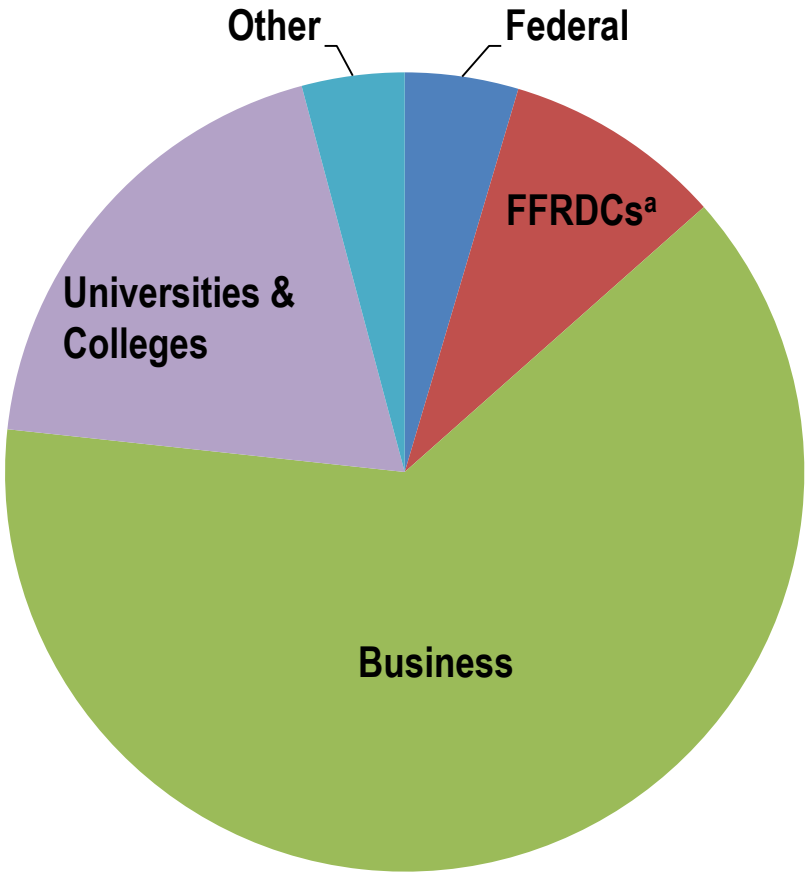
Source: Bureau of Labor Statistics.

Real Colorado GDP
1997-2011



Source: Bureau of Economic Analysis.

Colorado R&D Expenditures
by Performing Sector, 2010



National R&D

- $408 billion expended in 2010, $428 billion in 2011, $453 billion in 2012
- Industry largest share (69%), followed by universities and colleges, and federal government

Colorado R&D

- $6.2 billion in R&D
- Most R&D performed by business, followed by universities and colleges, and federal government
- $2.3 billion in federal R&D expenditures in 2010

Source: National Science Foundation. [a]Federally funded research and development center.

Population per FLC Lab

- Federal Laboratory Consortium for Technology Transfer (FLC)
- Nationwide network of federal labs
- Provides a forum to develop strategies, partnerships, and other opportunities for linking lab technologies and expertise to the market
- Out of 317 labs in the FLC, Colorado is home to 13
- Colorado 4th in number of labs
- Colorado 7th in lab density

Rank	State	Population per FLC Lab
1	Maryland	99,738
2	Wyoming	288,206
3	Mississippi	331,658
4	North Dakota	349,814
5	Alaska	365,725
6	Virginia	372,085
7	Colorado	399,045
8	South Dakota	416,677
9	New Mexico	417,108
10	New Hampshire	440,239

Sources: Lab data from the Federal Laboratory Consortium and population data from the Census Bureau. Calculations by BRD staff.

Colorado R&D Funding and Rank
by Federal Agency

Funding Agency	Amount Received (in thousands)	Percent of Agency Total	National Ranking
NASA	$1,237,123	20.9%	2
Dept. of Commerce	206,149	18.0%	2
Dept. of Interior	65,391	9.1%	2
National Science Foundation	333,853	5.5%	4
Dept. of Energy	341,881	3.5%	8
Dept. of Transportation	21,596	2.6%	8
Dept. of Agriculture	47,243	2.1%	15
Dept. of Defense	1,209,987	1.6%	18
Dept. of Health & Human Services	393,792	1.1%	20
Dept. of Homeland Security	4,920	0.7%	23

Source: National Science Foundation.

Participating Labs

Boulder County

- Cooperative Institute for Research in Environmental Sciences (CIRES)
- JILA
- Laboratory for Atmospheric and Space Physics (LASP)
- National Ecological Observatory Network (NEON)*
- National Oceanic and Atmospheric Administration (NOAA)
- National Institute of Standards and Technology (NIST)
- National Telecommunications and Information Administration (NTIA)**
- University Corporation for Atmospheric Research (UCAR)

*New addition to study in 2013.
**Did not submit response in 2010.
***Did not submit response in 2013.

Participating Labs

Larimer County

- Centers for Disease Control and Prevention (CDC/DVBD)**
- Cooperative Institute for Research in the Atmosphere (CIRA)
- DOI North Central Climate Science Center***
- U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS)
- U.S. Department of Agriculture, Rocky Mountain Research Station (RMRS)
- U.S. Department of Agriculture, National Wildlife Research Center (NWRC)

Jefferson County

- Bureau of Reclamation Technical Service Center**
- National Renewable Energy Laboratory (NREL)
- U.S. Geological Survey (USGS)

Other County

- DOT/FRA – Transportation Technology Center (Pueblo County)*
- USDA – Agricultural Research Service (Washington County)

*New addition to study in 2013.
**Did not submit response in 2010.
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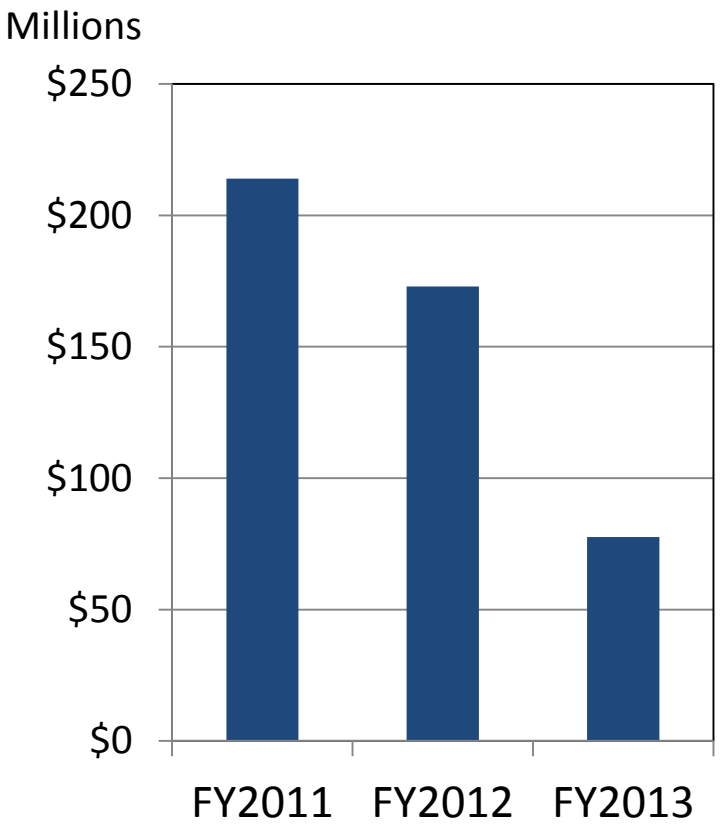
Key Findings 2012

- State net economic benefit:
  - $2.3 billion in output
  - Increase in number of labs
  - Increase in activity at some labs, decrease at others
- Direct operating spending at Colorado facilities:
  - $1.2 billion
- Increase in infrastructure spending:
  - $173 million
- Direct employment:
  - Nearly 8,000 employees

Construction

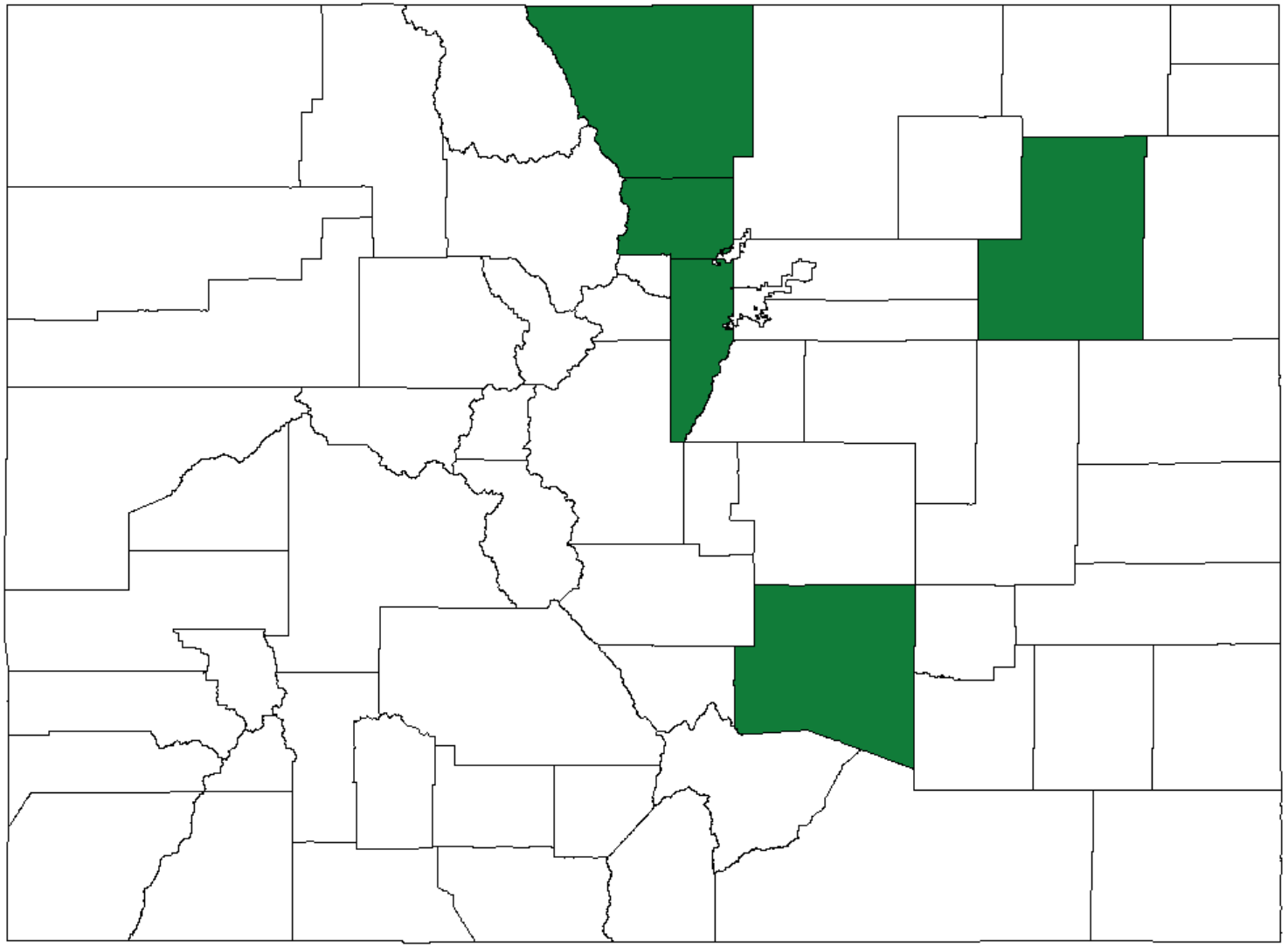


- Composed of
  - Materials
  - Soft costs
  - Labor
- Counter-cyclically supported construction

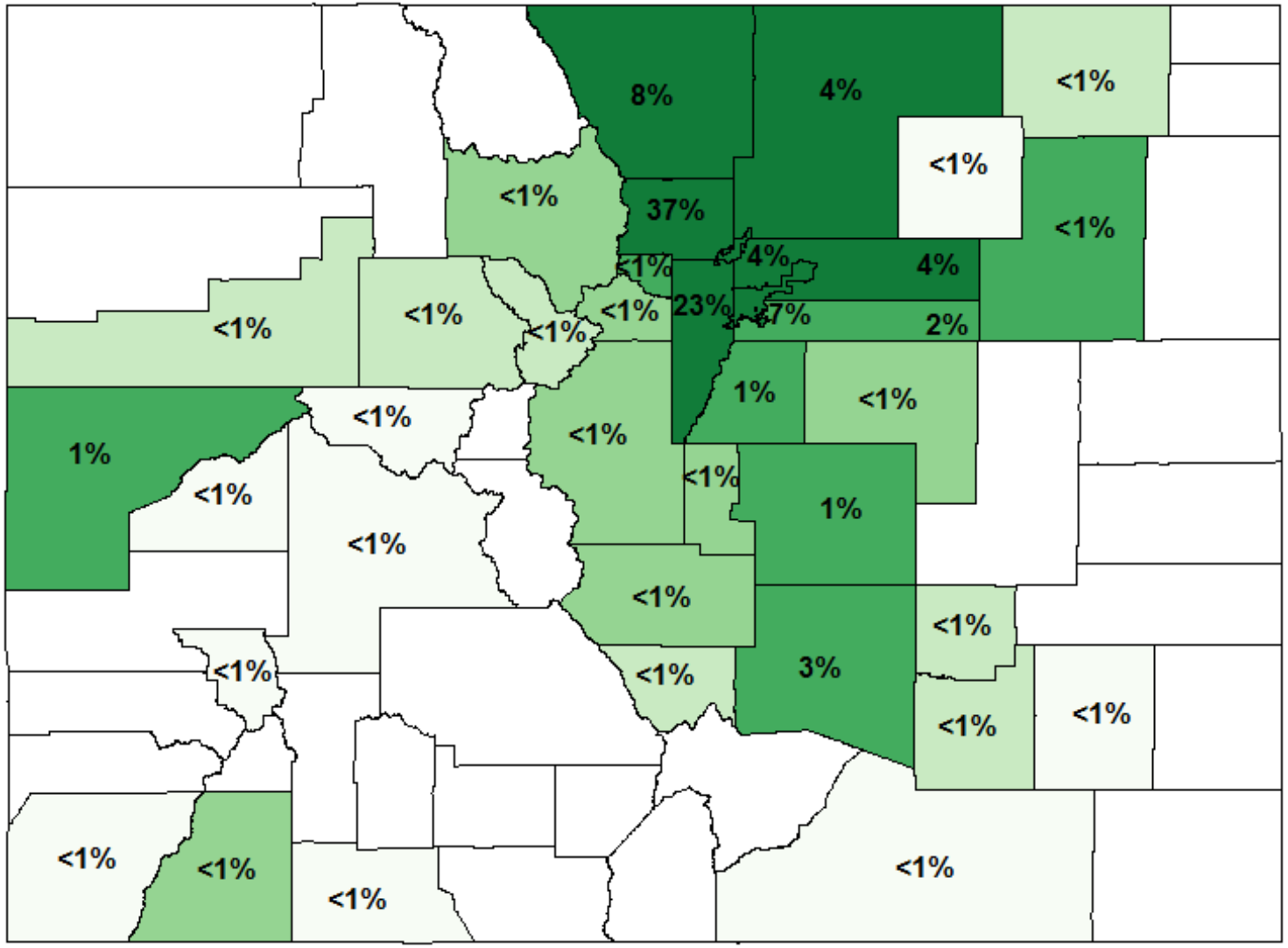
Operations

- $1.2 billion in direct spending in Colorado (FY 2012)
  - $764 million in labor
  - $375 million in operating expenditures
  - $50 million in lease payments
- 7,966 employees
  - 6,519 full-time
  - 771.8 part-time and student
  - 675 contract workers
- Weighted average salary and benefits: $98,819
  - Average salary est. $69,470
  - Average for all industries $50,559

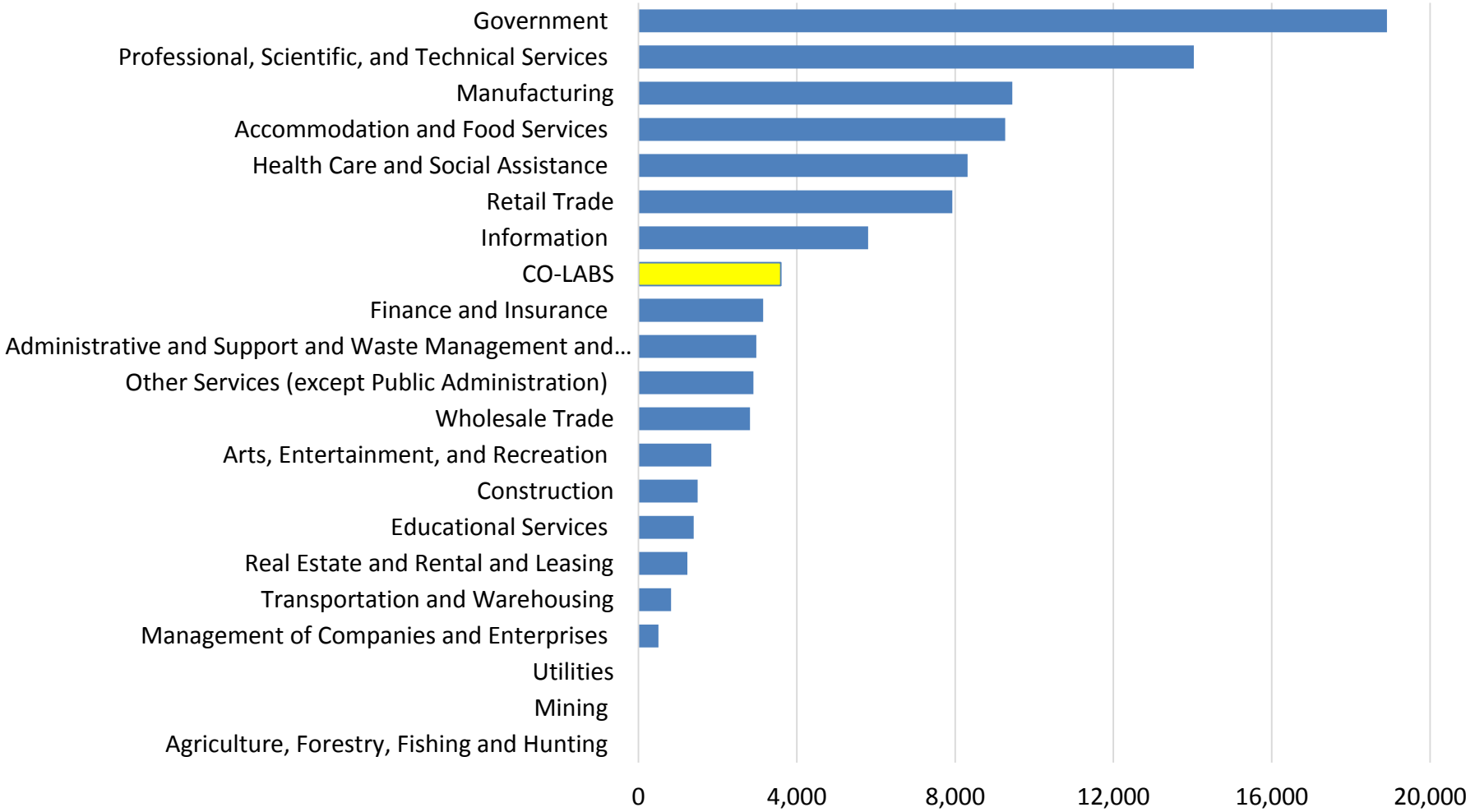
Lab Locations



Employee Labor Shed



City of Boulder Employment
CO-LABS and Total Employment



Impact of Colorado Federal Labs
on Colorado, in Thousands

Summary of Impacts	FY2011	FY2012	FY2013
Operations			
Output (Millions)	$2,024.2	$2,023.8	$1,922.7
Value Added (Millions)	$1,448.5	$1,439.1	$1,367.3
Employment	16,162	15,749	14,913
Construction			
Output (Millions)	$324.1	$303.1	$123.1
Value Added (Millions)	$181.7	$169.5	$69.4
Employment	2,721	2,503	995
Total			
Output (Millions)	$2,348.2	$2,326.9	$2,045.8
Value Added (Millions)	$1,630.2	$1,608.6	$1,436.7
Employment	18,883	18,253	15,908

Intangible Benefits

Community, Business, Educational . . .

- Employment and neighborhood stability
- Educating the public
- Educating school children
- Volunteering
- Cooperative research agreements
- Start-up/spin-off companies
- Licensing and commercialization of technology

Case Studies

Photo Copyright University Corporation for Atmospheric Research

NCAR: Forecasting Fire, Water, and the Renewable Energy Future

The National Center for Atmospheric Research (NCAR) seeks to develop and transfer knowledge and technology that contributes to the betterment of life on Earth. Guided by this mission, NCAR scientists study the behavior of the Earth system. Many of the phenomena studied by NCAR—wildfire, water, and production of renewable energies developed from wind and sun—have critical significance for Colorado. NCAR researchers' knowledge on atmospheric science, experience with technology transfer, and effectiveness at collaborating with decision makers, those in private industry, and scientists at other top research organizations uniquely qualifies the center to support our nation's efforts to better understand wildland fires and streamflow dynamics, as well as aid the transition toward renewable energy.

Wildfire

Colorado is no stranger to wildfires. As Colorado and many other parts of the western United States know all too well, such fires can adversely affect humans and ecosystems as well as water and air quality. The heat and smoke from fires also can influence nearby cloud systems and precipitation patterns. On average, the United States spends $2 billion per year on fire suppression but, according to economists, loses as much as 10 to 50 times that amount in timber and forage values, landscape rehabilitation, lost recreational opportunities, local business activity, and losses from flooding and mudslides in burn areas.

NCAR scientist Janice Coen has developed Earth system models to improve understanding and prediction of wildfire growth and dynamics. The Coupled Atmosphere-Wildland Fire Environment (CAWFE) model pairs an NCAR-developed weather prediction model with a wildland fire behavior model that represents how wildfires might propagate across a landscape. The weather model is one used to make daily weather predictions, while the wildland fire component shows how weather, topography, and fuels such as vegetation affect how fast a fire spreads. This fire modeling capability has also been added to the advanced research version of the Weather Research and Forecasting (WRF) model, a

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Thank You